UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PROCESS OF EXTRACTING COPPER PYRITES.

SPECIFICATION forming part of Letters Patent No. 465,250, dated December 15, 1891.

Application filed February 17, 1890. Serial No. 340,788. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented an Improvement in Processes of Extracting Copper Pyrites, (Case No. 851,) of which the following is a specification.

The object of my invention is to cheapen and simplify the extraction of copper pyrites or chalco-pyrite from the worthless gangue with which it is mixed, and more especially from pyrites of iron.

A further object is to separate copper pyrites and iron pyrites from the gold, silver, or other valuable constituents of the ore.

According to my invention I first crush the ore, then, by vanning, jigging, or other suitable operation, I concentrate the heavy pyrites and free the same from the quartz mixed therewith. The residue is then preferably dried, and if the ore contains pyrrhotite or magnetic pyrites it is run through a magnetic separator. The ore may be passed through the magnetic separator without being first dried with good results. This removes one class of foreign material—namely, the magnetic pyrites. The remainder or non-magnetic material, containing iron and copper pyrites, is then heated to a temperature of from 700° to 800° Fahrenheit, the effect of which is to reduce the amount of sulphur in the copper pyrites to a point where it becomes magnetic; but such degree of heat is insufficient to eliminate the sulphur from the iron pyrites. The material which has been thus heated is then again run through a magnetic separator, whereby the whole of the copper pyrites, which, as above stated, has been rendered magnetic by heating, is separated. The iron pyrites, which constitute the greater part of the non-magnetic material, at this stage of the process may be either thrown away or utilized in the arts—for example, in the manufacture of sulphuric acid. The heating of the ore above referred to is preferably, though not necessarily, done in a closed rotating cylinder or furnace, care being taken not to have the heat sufficient to roast the ore enough to render the whole mass magnetic. The manner of heating is not, however, important, so long as it renders the copper pyrites only magnetic. The temperature should be such as to eliminate a portion, but not all, of the sulphur from the copper pyrites, so as to make it magnetic, and not sufficient to eliminate any sulphur from the iron pyrites. Since ores vary greatly in quality, it is impossible to give a degree of temperature applicable to all ores. The exact temperature which is best must be ascertained by experiment on each ore. Generally 750° Fahrenheit will be about the heat required, while 1,000° would be too high and would render the whole of the ore magnetic. The magnetic pyrites may be separated magnetically in any well-known or suitable separator—such, for example, as that set forth in the application of Edison and Dickson, No. 337,523.

To illustrate the operation of this process, suppose we have one hundred tons of ore containing forty parts of magnetic pyrites, three parts of chalco-pyrites or copper pyrites, thirty parts of iron pyrites, and twenty-seven parts of silica, all mechanically mixed. If the whole is crushed, say, to forty mesh and run through the magnetic separator, the magnetic pyrites, or forty tons, are eliminated. Then the non-magnetic material is either heated to make the copper pyrites magnetic, and that separated from the other, making three tons, or the jig or vanner is used to eliminate the quartz before heating; but this is not necessary, except where the ore contains such a large quantity of quartz as to render the heating expensive. Thus one hundred tons of raw ore has its valuable contents reduced to three tons, which may be run into a rich matte in the usual manner.

If the ore to be treated is auriferous, I first concentrate it by jigging or the use of a vanning-machine. I then dry the concentrated ore and separate the magnetic portions with a magnetic separator, then heat the further-concentrated ore to 700° Fahrenheit, or otherwise render the chalco-pyrites magnetic and separate the same magnetically, then reheat the undecomposed iron pyrites to a higher temperature, thereby rendering it magnetic, and then separate it magnetically, leaving the whole of the gold, lead, silver, &c., in the residue, which is afterward treated by the usual process.

Having thus described my invention, what I claim is—

1. The method of concentrating chalco-pyrite ores by eliminating magnetically any magnetic material therein while the copper and iron pyrites are non-magnetic, and then heating the remainder to such a temperature as to render the chalco-pyrite magnetic and separating the reduced chalco-pyrites magnetically, substantially as set forth.

2. The method of concentrating chalco-pyrite ores, which consists in crushing the ore to disengage the chalco-pyrites, iron pyrites, earthy gangue, and the magnetic pyrites, magnetically separating the magnetic pyrites, heating the residue, thereby rendering the chalco-pyrite magnetic, and magnetically separating the same, substantially as set forth.

3. The process of separating pulverized chalco-pyrite and iron pyrites or other materials which are rendered magnetic by heat from other non-magnetic material, which consists in heating the mass sufficiently to render the chalco-pyrite magnetic and magnetically separating the same, then heating the residue to a higher temperature and magnetically separating the iron pyrites, substantially as described.

4. The method of obtaining copper and the other valuable constituents of chalco-pyrite ore, which consists in first concentrating the whole by vanning or otherwise, separating the naturally-magnetic material magnetically, then heating the remainder to a temperature sufficient to render the chalco-pyrite magnetic and insufficient to render the iron pyrites magnetic, separating the magnetic chalco-pyrite magnetically, then reheating the remainder to a much higher temperature to render the iron pyrites magnetic, and separating the same magnetically, leaving the gold, silver, lead, &c., as a final non-magnetic residue, substantially as described.

This specification signed and witnessed this 8th day of February, 1890.

THOMAS A. EDISON.

Witnesses:
THOMAS MAGUIRE,
A. CLARE.